S
363.3493
7016
N7rbf
1985

BIBLIOGRAPHY OF LITERATURE

PLEASE RETURN

Related to Floodplain Management in Montana

August 1985

STATE DOCUMENTS COLLECTION

MAY 6 - 1986

MONTANA STATE LIBRARY
1515 E. 6th AVE.
HELENA, MONTANA 59620

MONTANA STATE LIBRARY
S 363.34937016 N7rbf 1985 c.1
Resource bibliography for floodplain man
3 0864 00052597 5

DEPARTMENT OF NATURAL RESOURCES
AND CONSERVATION
WATER RESOURCES DIVISION

TED SCHWINDEN, GOVERNOR

32 SOUTH EWING

STATE OF MONTANA

(406) 444-6601 ADMINISTRATOR
(406) 444-6646 ENGINEERING BUREAU
(406) 444-6668 WATER DEVELOPMENT BUREAU
(406) 444-6601 WATER MANAGEMENT BUREAU
(406) 444-6610 WATER RIGHTS BUREAU

HELENA, MONTANA 59620

July 1985

Dear Floodplain Administrator:

We are pleased to present the second edition of the Floodplain Management Bibliography. We have included appropriate literature published since the 1982 edition. We hope this bibliography will be helpful to administrators researching floodplain management and flood-proofing techniques and issues. Anyone searching for information on the National Flood Insurance Program or other flood regulations can make use of this bibliography.

If you need further information or have suggestions or additions for the bibliography, please contact the Floodplain Management Section, DNRC, 32 S. Ewing, Helena, MT 59620 (or in late fall 1985, at our new address 1550 East 6th Ave., in Helena).

Deeda Richard

Deeda Richard
NFIP State Coordinator

Digitized by the Internet Archive
in 2011 with funding from
Montana State Library

http://www.archive.org/details/resourcebibliogr1985mont

RESOURCE BIBLIOGRAPHY
FOR FLOODPLAIN MANAGEMENT
IN MONTANA

Prepared by the

Floodplain Management Section
John Hamill, Supervisor
Deeda Richard, NFIP Coordinator

Montana Department of Natural Resources and Conservation
32 South Ewing
Helena, MT 59620

ABSTRACT

Publications addressing floodplain management, planning, and regulations that may be pertinent to Montana are listed and, in most cases, briefly described.

DISCLAIMER

The work on this publication was funded under a cooperative agreement with the Federal Emergency Management Agency. The substance and findings of this work are dedicated to the public. Any conclusions in the reports named do not necessarily reflect the views of the government.

ACKNOWLEDGMENTS

This bibliography was produced as part of a cooperative agreement by the Floodplain Management Section, Montana Department of Natural Resources and Conservation (DNRC), and the Federal Emergency Management Agency. DNRC staff who contributed are: John Hamill, Supervisor of Floodplain Management, and Deeda Richard, NFIP Coordinator; Millie Sullivan, research specialist, technical assistance; Marjorie Peterson, text processing; and Peggy Todd, editing.

TABLE OF CONTENTS

		Page
A.	Laws and Legal Issues Regarding Floodplain Management	1
	1. National	1
	2. Executive Orders	2
	3. Montana	4
	4. Other States	5
	5. General	6
B.	Floodplain Management	8
	1. National Level (NFIP)	8
	2. State Level (General and Pertaining to Montana)	11
	3. Local Level (Urban, Communities, and Counties)	12
	4. Multi-Level (Local, State, Federal and/or Private)	15
	5. Economic, Environmental and Social Evaluations	17
	6. Land Use and Land Acquisition	23
	7. Engineering, Hydraulic and Hydrologic Studies and Mapping	25
	8. Design Guides and Handbooks	28
	9. Floodplain Regulations	30
	10. Structural and Nonstructural Flood Hazard Reduction	31
	11. Studies in Other States, Regions, and Countries	35
C.	Stormwater Management and Urban Drainage	39
D.	Montana Floodplain Studies	42
	1. Studies by County (including Cities)	42
	2. Studies by Drainage Basin or Geographic Areas	54
	3. General	56
E.	Other Resources--Film, Tapes, Slide Shows & Bibliographies	58

PREFACE

Floodplain managers must consider many facets of the problem of flooding. Before adequate plans can be made to protect an area and its residents, a history of local flooding must be collected. From this information, inundation maps and computer modeling can be utilized to predict flood events. Planning may incorporate structural and nonstructural preventive measures, hazard reduction and repair, and disaster relief.

This bibliography is intended to aid floodplain managers in their work. It is divided into five sections; all titles within a section are alphabetically arranged, with a brief annotation for each. The first section contains federal, state, and local floodplain laws and legal issues. The second includes studies and reports on the many aspects of floodplain management, ranging from national and state level problems to economic, environmental and social evaluations of land in floodplains. Stormwater management and urban drainage studies make up the third section. Studies specific to Montana make up the fourth section. Other resources are listed in the last section.

Copies of some of the documents are available at the Floodplain Management Bureau of the Water Resources Division of the Department of Natural Resources and Conservation, 32 S. Ewing, Helena 59620 (or in late fall 1985, at our new address 1550 East 6th Ave. in Helena). Others can be obtained through the Montana State Library, 1515 East Sixth, Helena 59620, or through interlibrary loan from local libraries.

SECTION A

The laws and legal issues affecting floodplain management can be complex and confusing. The publications in this section will help to clarify the issues and provide new insights. Guidelines on implementing floodplain laws are included.

A. LAWS AND LEGAL ISSUES REGARDING FLOODPLAIN MANAGEMENT

A1. National

The National Flood Insurance Program: Explanation and Legal Implications. Tierney, G., Federal Highway Administration, Washington, DC. 1976.

This journal article gives historical background of NFIP, and suggests a solution to problems such as those of individuals who are not eligible for flood insurance because their communities are not enrolled in the program. It suggests that Congress assumes direct federal control of land use in flood prone areas.

Turning Point. Bernstein, George K. Water Spectrum 6 (1974), pp. 8-14.

The Flood Disaster Protection Act of 1973 forces flood-prone communities to practice floodplain management. It also strengthens the 1968 Flood Insurance Program.

A2. Executive Orders (EO)

Discussion Paper on Missouri River Basin Floodplain Management: An Analysis of EO 11988 and Optional Policies. Missouri River Basin Commission, Omaha, Nebraska. 1978.

The objectives of this paper are to: (1) examine the directives of EO 11988 to federal agencies; (2) examine the draft guidelines of the Water Resources Council and federal agencies proposed to implement the order; (3) examine the order's effects on state FPM activities; (4) determine the current status of title II river basin commission policy statements on FPM; (5) list alternative methods of developing a policy statement for the Missouri River Basin; and (6) consider an interim FPM policy.

Floodplain Management Guidelines for Implementing EO 11988. U.S. Water Resources Council, Washington, DC. 1978.

These guidelines provide (1) explanation of key terms and floodplain management concepts; (2) section-by-section analyses of the Order; and (3) how decisions are made through agencies on whether a proposed development may be located in a base floodplain.

Floodplain Management Policy as Applicable to HUD's Implementation of EO 11988 and 11990. Dept. of Housing and Urban Development, Washington, DC. 1982.

Some government policies (including HUD's) have resulted in contradictory handling of funding support in cases where housing is being placed in flood-prone areas. This has increased insurance costs and flood-proofing expenditures, as well as raising costs to the public of disaster relief, flood insurance subsidies, and relocation.

Implementation of EO 11988 (Floodplain Management) and 11990 (Protection of Wetlands). Fullerton, F.P., Federal Register, Vol. 43, No. 136, pp. 30494-95. 1978.

The proposed procedures prescribe policies for the United States Section, International Boundary and Water Commission, in implementing EO 11988 and 11990 as they pertain to the planning, design, and construction of treaty projects along the United States-Mexican boundary and to the United States Section's operation and maintenance activities.

Implementation of EO 11988 on Floodplain Management. Corps of Engineers, Washington, DC, Federal Register, Vol. 43, No. 101, pp. 22306-08. 1978.

This proposed regulation prescribes policies to be used by the Corps of Engineers in implementing EO 11988. The objectives of the EO are to avoid the long and short term adverse impacts associated with floodplain occupation and modification.

Natural Hazard Mitigation EO 11988 Floodplain Management. Resources Documents, Federal Emergency Mangement Agency. 1981.

This report contains copies of EO 11988 and 11990 on floodplain management and wetland protection. Guidelines, regulations, and environmental assessments pertaining to these orders are covered. The National Environmental Policy Act and regulations are included. This report also contains the National Flood Insurance Program regulations, interagency agreements, and a proposal for a unified national program.

Procedures for Complying with EO 11988 on Floodplain Management and EO 11990 on Protection of Wetlands. Dept. of Agriculture, Washington, DC, Federal Register, Vol. 43, No. 112, pp. 25322-24. 1978.

Agencies of the Dept. of Agriculture are developing policies and procedures for complying with EO 11988 and EO 11990. The Dept. of Agriculture gives notice of its proposed policy for compliance with the two EOs.

A3. Montana

Floodplain Management, Administrative Rules and Regulations. Montana Department of Natural Resources and Conservation, Helena. 1980.

Listed in sections 36.15.101 through 903 Administrative Rules for implementation of the Montana Floodplain and Floodway Management Act, Title 76, Chapter 5, MCA.

Montana Floodplain and Floodway Management Act. Montana Codes Annotated, Sections 76-5-101 through 76-5-406.

A4. Other States

Problems Under State Water Laws: Initiation of New Rights. Dewsnup, R.L., Natural Resources Lawyer, Vol. 8, No. 2. 1975.

Utah is experimenting with a prototype program for water resource conservation and development involving public acceptance of a plan designed to establish hydrologic units. If the experiment succeeds, anyone who planned to appropriate water in such a unit could determine from the plan whether the proposed use was compatible.

Water Law--Act of God Defense--Flood Damage from Reservoir Overflow. Sanford, K.T. Denver Law Journal: 50 (1973), pp. 381-388.

When damages result from the overflow of a reservoir, Colorado statute provides for absolute liability. A recent Colorado court decision states that flooding not foreseeable by reasonable engineering techniques may be an "act of God" for legal purposes.

A5. General

Legal Problems in Regulating Flood Hazard Areas. Linebman, Ernst. National Water Commission, Washington, DC. ASCE J Hydraulics Division 99 (1973), pp. 2113-2123.

Effective floodplain management requires both structural and nonstructural measures. Legislated restrictions on land use are an effective nonstructural method.

The Ordinary High Water Mark: Attempts at Settling an Unsettled Boundary Line. Maloney, F.E. Land and Water Law Review, Vol. XIII, No. 2, pp. 1-35. 1978.

The ordinary high water line is typically defined as the boundary between privately-owned riparian uplands and publicly-owned lands beneath non-tidal navigable waters. Considered are the definition of the ordinary high water line, the question of whether federal common law controls the definition of the line, the use of the meander line as an alternative boundary, the necessity of an ambulatory line, and the question of whether a definition based on statistical averaging would be legally valid.

SECTION B

Much of the material in this section is the result of investigations and research carried out in many different regions of the United States. A few reports originated in other countries. The information contained here can be applied to similar situations in Montana. For instance, many parts of Montana have the same conditions common to arid regions in our Southwest.

Studies of the problems typical to these areas because of climate and topography can be helpful to floodplain managers and residents as well. Where solutions have resulted from studies, they can often be adapted to local needs.

B. FLOODPLAIN MANAGEMENT

B1. National Level

Alternatives for Standards and Regulations. Mrazik, Brian R., and Krimm, Richard W. HUD, Washington, DC. In "Proceedings of the Engineering Foundation Conference on Improved Hydrological Forecasting — Why and How," pp. 375-386. ASCE, New York. 1980.

Regulations of the National Flood Insurance Program place occupancy and construction requirements on participating communities. Some regulations may need to be changed. Also engineers providing data for program administration may face new demands.

Conditions and Criteria for Appeals of Proposed Base Flood Elevation Determination. Federal Emergency Management Agency (FEMA). 1984.

These guidelines are intended to inform appellants of FEMA's National Flood Insurance Program requirements for appeals and provide descriptions of the data submission requirements which will assist appellants in preparing a complete and well-documented appeal. Compliance with the criteria described herein will allow FEMA to address and resolve the appeal in a timely manner and assure that the most current base flood elevation data is used when the final determination for the community is made.

Federal Disaster Assistance--Program Guide. HUD-370-FDAA(3), Washington, DC. 1976.

This report focuses upon the coordination and improvement of the existing programs necessary to achieve a unified approach to management of the nation's floodplains.

Flood Insurance Program: Regional Agency's Perspective. Walesh, Stuart G. Journal of the Water Resources Planning and Management Division, Proceedings of the American Society of Civil Engineers, Vol. 105. 1979.

Problems of the National Flood Insurance Program are contrasted with its positive features. Suggestions for improvements include conducting flood studies by watershed and encouraging land-use planning and control along rivers.

Flood Studies Led to National Flood Insurance. Edelen, G.W., Jr., Ferguson, G.E., and Langbein, W.B. USGS, Water Resources Division, Reston, Virginia. Civil Engineering-ASCE (February 1979), pp. 89-91.

Data provided by the USGS has played a major role in public efforts to deal with flood hazards. Those efforts have generally changed from construction works to land-use regulations and, especially, the National Flood Insurance Program.

Floodplain Development Pressures and Federal Programs. Part III: Case Study Reports. Dean, Lillian, F., Environmental Protection Agency, Washington, DC. 1978.

Thirty-one case studies of floodplain development pressures and federal programs are documented in this report. The cases document the sequence of federal programs and the relationship of the programs to community development and floodplain development.

A Levee Policy for the National Flood Insurance Program. National Research Council, Washington, DC. 1982.

The report issued October 1982 gives Federal Emergency Management Agency recommendations for a comprehensive levee policy concerning minimum design criteria for levees; levee inspection and evaluation; operation, maintenance and other local requirements in leveed areas; treatment of levees in the insurance aspects of the National Flood Insurance Program; and flood mapping approaches in levee areas.

Managing Flood Risk: Technical Uncertainty in the National Flood Insurance Program. Baram, M.S.; Miyares, J.R., Columbia Journal of Environmental Law, Vol. 7, No. 2, pp. 129-164. 1980.

Two major problems have emerged under the National Flood Insurance Program. First, restudy costs of a community's flood risk have become prohibitive. Second, new technical developments in floodplain mapping and risk prediction are continually being made. This paper proposes that criteria be developed to guide the Federal Emergency Management Agency (FEMA) in deciding when restudies should be undertaken or new study methods adopted.

National Flood Insurance Program—Major Changes Needed if It Is to Operate Without a Federal Subsidy. General Accounting Office, Washington, DC. 1983.

GAO recommends improvement of the agency's rate-setting process and congressional review of flood insurance financing, but advises caution in reducing government subsidy.

National Flood Insurance Program: Marginal Impacts on Floodplain Development—Administrative Improvements Needed. General Accounting Office, Washington, DC. 1982.

GAO was requested by a Senate subcommittee and a senator to determine whether (1) the National Flood Insurance Program administered by the Federal Emergency Management Agency was stimulating floodplain development and (2) floodplain management regulations were being adequately enforced. GAO found that: (1) Although much development is occurring in the floodplain, flood insurance is not the principal reason for that development; (2) The Agency needs a better monitoring program to assure that local communities are enforcing floodplain regulations; and (3) Many flood insurance policy premiums are based on erroneously designated (misrated) flood zones.

National Flood Insurance Program: Some Midstream Perspectives. Platt, R.H. Journal of the American Institute of Planners, Vol. 43, No. 3, pp. 303-313. 1976.

The history of floodplain regulation and an overview of the National Flood Insurance Program (NFIP) are presented as background to a discussion of implementation of the NFIP. Four issues of floodplain management and the NFIP stand in the way of final implementation--the constitutional issue, the mapping issue, the rate issue, and the regulatory issue. The accepted resolutions of these problems are presented and analyzed.

Questions and Answers, National Flood Insurance Program. FEMA-FIA Washington, DC. FIA-2, February 1983.

Answers to common questions regarding the National Flood Insurance Program.

B2. State Level (General and Pertaining to Montana)

Floodplain Management In Montana. Parrett, C. Floodway Management Bureau, Montana Department of Natural Resources and Conservation, Helena. In "Hydraulic Engineering and the Environment: Proceedings of the 21st annual Hydraulic Division Specialty Conference," pp. 85-91. ASCE, New York. 1973.

Montana's floodplain law is based on working programs in Nebraska and elsewhere, and seems generally effective. The program, however, faces two major problems. Floodplains often are developed faster than data necessary to manage them can be supplied. Also, the public often opposes land-use regulations.

Model State Legislation for Floodplain Management. Natural Hazards and Research and Applications Information Center, University of Colorado, 1982.

The Association of State Floodplain Managers, under contract with the Federal Emergency Management Agency (FEMA), has developed model legislation to strengthen state programs. Any state wishing to strengthen its floodplain management program can review any of the model legislation options herein and select the approach which best befits its specific needs.

Montana Floodplain Management, Questions and Answers. Montana Cooperative Extension Service. Bulletin 1096. Bozeman. 1972.

Answers to common questions on floodplain management in Montana.

Strengthening State Floodplain Management. Bloomgren, Patricia, Water Resources Council, Washington, DC. 1981.

The purpose of this report is to help the Water Resources Council to determine the status of state programs and identify measures to strengthen such programs.

B3. Local Level (Urban, Communities, and Counties)

Boulder, Colorado: A Study in Growth. Flack, J.E. University of Colorado, Boulder. In "Man and the Quality of His Environment: Western Resources Conference," pp. 223-229. 1968.

Conference participants discussed preserving the natural environment in the face of urbanization. Boulder has dealt well with most of its environmental problems, especially water supply and air pollution. Water pollution and transportation will be addressed soon. Flood management needs immediate action.

Community Goals - Management Opportunities: An Approach to Floodplain Management. U.S. Army Engineering Institute for Water Resources, Center for Urban Studies, University of Chicago. 1970.

This report focuses on the selection and implementation of floodplain management alternatives in an urban setting. The report suggests that successful floodplain management programs need to be integrated with other urban programs to encourage cooperation at all levels of government.

Cooperative Flood Loss Reduction: A Technical Manual for Communities and Industry. Owen, H. James, Flood Loss Reduction Associates, Palo Alto, California. For SEDA-Council of Governments and U.S. Water Resources Council, Washington, DC. U.S. Government Printing Office. 1981.

Sources of assistance in planning and carrying out various loss reduction measures are identified and selected references are listed.

Evaluating the Effectiveness of Floodplain Management Techniques and Community Programs. Proceedings of a Seminar, National Hazards Research and Applications Center. 1985.

The goal of the seminar was to examine existing and alternative cooperative approaches for evaluating and monitoring floodplain management techniques and community programs. The seminar was intended to assess the "state of knowledge" on this important topic and to suggest some priorities for further research and action.

Flood Hazard Reports: Tools For Resource Planning and Management. Ringler, T.A., and Kennaugh, J.H. Soil Conservation Service, Grand Rapids, Michigan. Journal of Soil and Water Conservation 29 (1974), pp. 182-185.

Reports concerning floodplain boundaries and soil types, including maps, interpretive data, and soil descriptions, can provide a technical basis for local floodplain management. Various management methods are suggested.

Floodplain Management for Oregon Cities and Counties. University of Oregon, Eugene, Bureau of Governmental Research and Service, School of Community Service and Public Affairs, Planning Bulletin Number 10. Rev. 1978.

Most flood-prone land is good for something, but uses especially vulnerable to flood damage should be prohibited. Local governments are most able to control land use through their control of building permits and zoning. They may, however, need technical assistance.

Floodplain Management Handbook. Owen, H. James, and Wall, Glenn R. Flood Loss Reduction Associates, Palo Alto, California. For U.S. Water Resources Council, Washington, DC. U.S. Government Printing Office. 1981.

Provides step-by-step guidance for developing a floodplain management program. Identifies the range of technical and financial assistance available for preparing and implementing such programs.

Floodplain Planning in Urban Areas. Pfeiffer, F.N. San Antonio River Authority. In "Proceedings of the 16th Annual Conference on Water for Texas," Urban Water Resources Planning and Management, pp. 75-83. Texas Water Resources Institute, San Antonio. 1971.

Floodplain management, essential to both congested and undeveloped urban areas, must consider both floodplain corridors and adjacent areas. Such management necessarily involves regulation, zoning, and maintenance.

Guide for Flood Preparedness Planning. Federal Emergency Management Agency, Order No. EMW-2-4595. 1983.

This guide provides assistance to community officials and planners in assessing their community's flood problem; evaluating the adequacy of their community's existing arrangements for flood warning and preparedness; determining the actions needed to develop a flood warning and preparedness program; and carrying out the planning process and implementing the program. The Guide is oriented toward riverine flooding, flooding due to urban stormwater runoff, and flooding due to dam failure.

Methodology for Evaluation of Feasibility: Multi-jurisdictional Urban Drainage and Flood Control Projects. Urban Drainage and Flood Control District, Denver, Colorado. National Technical Information Service, PB-292 576. 1977.

This method for judging the feasibility of urban flood control in Denver, Colorado, emphasizes damage reduction by nonstructural measures. The method involves cost/benefit analyses of damage reduction, description of other benefits, and trade-offs between the two.

A Process for Community Floodplain Management. Leman Powell Associates, Inc., Alexandria, Virginia. Office of Water Research and Technology, Washington, DC. 1979.

Guidelines for floodplain management address the combination of structural and nonstructural methods. Planning in general, as well as a variety of management techniques, is discussed.

A Process for Community Floodplain Management, Summary Report. Leman Powell Associates, Inc., Alexandria, Virginia. National Technical Information Service PB81-185282. Office of Water Research and Technology report OWRT TT/80, Washington, DC. 1980.

Promising methods for managing floodplains, including a combination of various methods, preservation of resources, the nature of floods, economic and social impacts, federal law, and assistance to communities are addressed.

Scenario Methodology in Natural Hazards Research. Ericksen, N.J., Program on Technology, Environment, and Man, Institute of Behavioral Science, University of Colorado, Boulder. National Technical Information Service PB-262 024. 1975.

Scenario methods and interconnections within natural hazard relief systems are studied. Management alternatives for local communities, particularly Boulder, Colorado, are suggested, especially in regards to flood control.

B4. Multi-level (Local, State, Federal and Private)

Federal Participation in Land Use Decision-Making at the Water's Edge--Floodplains and Wetlands. Holmes, B.H. Economic Research Service, Washington, DC, Natural Resource Economics Div., Natural Resources Lawyer, Vol. 13, No. 2, pp. 351-410. 1980.

Land use regulation, traditionally the prerogative of states and local governments, is increasingly a federal concern, particularly in the sphere of water resources. A unified national wetlands protection management program is emerging.

Floodplain Management Information Report, New York. Army Engineering, District, Buffalo, New York. 1972.

State and local agencies are advised on how to identify flood-endangered areas. Encourages flood management.

Handbook for a Floodplain Management Strategy. Zensinger, Larry; McClure, Gary; and Faulkner, Pat. East-West Gateway Coordinating Council, St. Louis, Missouri. HUD, St. Louis. 1974.

The flood of 1973 shows the need for regional and local flood management policies. Flooding is described and solutions suggested. The National Flood Insurance Program is also explained.

Local Assistance Series: 1B - Directory of Floodplain Agencies. Army Engineering District, Chicago, Illinois. January 1980.

Federal, state, and regional agencies available to local governments and citizens seeking help with flood-related problems are listed.

Management Problems in Floodplain Areas. Lee, Thomas M. Floodplain and Shoreland Management Program, Madison, Wisconsin. ASCE J Water Harbors Coastal Engineering Division 98 (1972), pp. 357-373.

Floodplain management should be part of an overall national or state land-use policy, not an isolated effort just to prevent flood damage. Revising land taxation would help floodplain management.

Multi-Government Management of Floodplains in Small Watersheds. Federal Emergency Management Agency, Washington, DC. 1981.

This report is limited to consideration of floods, primarily in urban watersheds.

A Unified National Program for Floodplain Management. U.S. Water Resources Council, Washington, DC. 1979.

This report focuses on the coordination and improvement of the existing programs necessary to achieve a unified approach to management of the nation's floodplains. A conceptual framework is provided to guide local, state, and federal decision-makers toward a balanced consideration of alternative goals, strategies, and tools. Recommendations for improving and coordinating floodplain management within each level of government and between levels of government should draw specific programs into a comprehensive integrated effort.

Urban Flood Management: Problems and Research Needs. Howells, David H. North Carolina State University at Raleigh. ASCE J Water Resources and Planning Management Division 103 (1977), pp. 193-212.

A 1975 panel on urban flood management discussed and reached conclusions regarding many subjects, including federal goals, policies, and actions in relation to state and local interests.

B5. Economic, Environmental and Social Evaluations

Altered Hydrology of the Missouri River and Its Effect on Floodplain Forest Ecosystems. Johnson, W.C., Reily, P.W., Andrews, L.S., McLellan, J.F., Brophy, J.A. National Technical Information Center, Springfield, Virginia. 1982.

Floodplain protection projects have long been suspected of having major, long-term effects on the natural dynamics of riparian ecosystems that remain in gaps between large reservoirs. This study documents the long-term effects on natural dynamics of riparian ecosystems between Garrison Dam and Oahe Reservoir on the Missouri River in south-central North Dakota. Such post-dam changes as river meandering rate, floodplain forest composition, tree population structure, and tree growth rate are documented.

Assessment of Flood Management Alternatives Against Social Performance Criteria, Phase II Report. Mack, R. Institute of Public Administration, New York. National Technical Information Service PB-249543. 1975.

After studying the effects of various flood management strategies, a framework was developed for evaluating their social impacts on an equal basis with environmental and economic impacts.

A Computer Simulation Model for Floodplain Development, Part II, Model Description and Application. Arvanitidis, N.V., Rosing, J., Petropoulos, D.P., Jolissaint, C.H., and Poage, J.L. Intansa, Menlo Park, California. 1972.

The economic efficiency of various flood management programs is evaluated through a simulation model. The model calculates flood damages, allocates land uses, and calculates benefits of management.

Criteria for Evaluation of Social Impacts of Flood Management Alternatives. Mack, R. Institute of Public Administration, New York. National Technical Information Service PB-238 496. 1974.

Social impacts of floods and flood management measures do not readily fit into the usual cost/benefit analysis. Case studies are used in a system similar to cost/benefit analysis, but not based strictly on financial terms.

Dealing With Variable Flood Hazards. McCrory, Jerry A., James, L. Douglas, and Jones, D. Earl, Jr. Corps of Engineers, Fort Worth, Texas. ASCE J Water Resources Planning Management Division 102 (1976), pp. 193-208.

Curves for managing floodplains on the basis of equal exposure to damage are developed by considering the frequency of flood stages and the relative damage they cause. Acceptable exposure to damage is judged in relation to fire insurance, property taxes, and return on investment.

Economic Analysis of Alternative Flood Control Measures. James, L. Douglas. Kentucky Water Resource Institute, Lexington. Office of Water Research and Technology, Washington, DC. 1968.

EO 11296 requires federal agencies to seek the best combination of structural and nonstructural flood management measures. Two digital computer programs assess the alternatives. Computer analyses must be followed by field work.

Economic Analysis of Floodplain Management Alternatives. Ward, Frank. Montana Department of Natural Resources and Conservation, Helena. 1974.

In this paper a methodology is proposed for estimating the net benefits of floodplain zoning. It concentrates specifically on the changes in economic variables induced by flood zoning, even though there are many recognized legal and political difficulties that must first be overcome before floodplain zoning can be implemented. It provides an analytical framework that should be generally applicable.

Economic Efficiency of Floodplain Development. William M. Park, Purdue University, West Lafayette, Indiana. 1982.

The objectives include the development of a theoretical framework and the use of an empirical case study to explore the extent of over-allocation of resources in flood-prone areas and to establish alternative policies to correct this problem.

Economic Feasibility of Flood Proofing--Analysis of a Small Commercial Building. HUD-508-FIA, Washington, DC. 1979.

Flood proofing a new commercial building at Jersey Shore, Pennsylvania, to meet the minimum floodplain regulations of the NFIP, is not unduly costly and is economically feasible. The four flood proofing construction approaches examined include a structure (1) wet flood proofed; (2) raised on fill; (3) partially raised on fill and equipped with watertight closures; and (4) raised on columns. Benefit/cost ratios are favorable for the three flood proofing approaches. The findings and analytical methods employed in this investigation can be used as guidelines for commercial flood proofing efforts at other locations throughout the nation.

Emerging Issues in Wetland/Floodplain Management. Summary--Report of a Technical Seminar Series. Kusler, Jon A., Water Resources Council, Washington, DC. 1979.

The report is a summary of proceedings and recommendations of a series of technical seminars conducted by the U.S. Water Resources Council. The problem areas and recommendations cover: wetland and floodplain mapping; techniques of coordination of wetland and floodplain management efforts; criteria and procedures for processing of permits; federal, state, local and private roles in wetlands and floodplain management; acquisition of areas in fee and lesser interests; and research and study needs.

Estimating Costs and Benefits for Nonstructural Flood Control Measures. Carson, William D. University of California at Davis. 1975.

The economic effects of flood-proofing, evacuation/relocation, and land-use regulation are evaluated.

Evaluation of Economic, Social, and Environmental Effects of Floodplain Regulations. Sheaffer & Roland, Inc., consultants. HUD, Office of Policy Development and Research, Washington, DC. U.S. Government Printing Office. 1981.

Economic, social, and environmental effects of floodplain regulations on twenty-three communities are discussed.

Factors Affecting Public Acceptance of Flood Insurance in Larimer and Weld Counties, Colorado. Joel W. Jones, Colorado State University, Fort Collins, Colorado. 1977.

This study examines several factors which influence purchases of flood insurance and makes recommendations based on the findings.

Floodplain Delineation: An Economic Approach. Hughes, W.C., Colorado Univ. at Denver, Dept. of Civil and Urban Engineering, Water Resources Bulletin, Vol. 16, No. 2, pp. 267-270. 1980.

Errors inherent in computing water surface profiles are magnified by the shallow lateral slopes typical of many river valleys, often producing floodplain boundary errors several hundred feet wide. Nonetheless economic approaches to weighing the costs of overstating floodplain boundaries indicate it is better to err on the side of such overstatement.

Floodplain Management Must Be Ecologically and Economically Sound. Goddard, J.E. Civil Engineering ASCE 41 (1971).

Despite massive construction efforts, flood losses have increased in the United States over the last 35 years. There are often ecologically advantageous solutions; various federal measures aim in that direction. Developers, engineers, and ecologists must work together, and consider more than just money.

Floodplain as a Residential Choice. Resident Attitudes and Perceptions and Their Implications to Floodplain Management Policy. James, L.D.; Laurent, E.A.; and Hill, D.W. Environmental Resource Center Institute of Technology, Atlanta. Report 0671. 1971.

Residential settlement of floodplains is analyzed with regard to residents, developers, and government agencies. A model describes how residents choose a site, react to floods, and expect government help.

Guidelines for Establishing Economic and Engineering Flood Criteria. Crutchfield, J.A., and Hopkins, G.F., University of Washington, Seattle; and Barkley, P.W., et al., Washington State University, Pullman. Washington Department of Water Resources, Olympia. 1970.

This project was undertaken for the Washington Department of Water Resources to study means of increasing efficiency in the use of allocating funds.

Impact of Floodplain Regulations on Residential Land Values in Oregon. Muckleston, K.W. Water Resources Bulletin, Vol. 19, No. 1, pp. 1-7. 1983.

Ambiguities about the relationship between floodplain regulations and residential land values were investigated. The suggestion that floodplain regulations significantly depress appreciation rates of regulated lands relative to those of similar unregulated lands was rejected in most cases.

Long-Term Consequences of Upstream Impoundment. Petts, G.E., Environmental Conservation, Vol. 7, No. 4, pp. 325-332. 1980.

The environmental consequences of dam and reservoir construction on a river system are considered in a framework consisting of first-, second-, and third-order impacts. The immediate and simultaneous effects of the dam building activity are first-order impacts. Initial changes in aquatic life occur during the second-order stage, further adjustments occur as part of a third-order impact.

Management of Flooding in a Fully Developed, Low-Cost Housing Neighborhood. Novoa, Jose I., and Halff, Albert H. Albert H. Halff Associates, Inc., Dallas, Texas. Water Resource Bulletin 13 (1977), pp. 1237-1252.

Eight alternatives for flood management are evaluated for safety, social effects, and economic cost. Streamside parks and open spaces are preferred.

A Methodology for Floodplain Development and Management. TRW Systems Group, Redondo Beach, California. National Technical Information Service AD-704 716, Army Engineer Institute for Water Resources, IWR Report 69-3. Department of the Army, Chief of Engineers, Washington, DC. 1969.

A method commonly known as trade-off analysis evaluates the economic consequences of various alternatives for floodplain management. Case studies are included.

National Economic Development Benefits for Nonstructural Measures. Carson, William D. Hydrologic Engineering Center, Davis, California. 1980.

National benefits for nonstructural measures of flood management are discussed. Economic concepts, interpretations of regulations, summary tables, and narrative and tabular examples are provided.

Preliminary Review and Analysis of Flood Control Project Evaluation Procedures. Arvanitidis, N.V., Lind, R.L., Rosing, J., and Johnson, G.P. Intansa, Menlo Park, California. 1972.

To assess the economic effect of floodplain management, one must carefully determine the net increase in productivity brought about by a project when the project's benefit is the difference in productivity with and without the project.

Procedure for Estimating Total Flood Damage in Urban Areas. Grigg, Neil S., Colorado State University. 1974.

When flooding occurs in urban areas the category of damage normally reported in the press and therefore receiving most attention, is direct damage to property. This is, however, only one of five empirical categories of flood damages. The five categories are: direct, indirect, secondary, intangible, and uncertainty damages. These categories of damage are very briefly discussed according to how they affect urban drainage decisions.

Public and Private Impacts of Alternative Flood Assistance, Insurance, and Recovery Efforts. Boisvert, R.N., Rettger, M.J. National Technical Information Service, Springfield, Virginia 22161. 1979.

Alternative federal flood disaster assistance programs are evaluated through an economic comparison of flood insurance and disaster loan programs. The distribution of costs, benefits, and program transfers, both private and public are parameters.

Rational Investment Behavior in the Face of Floods. McGuire, C.B., Center for Research in Management Science, UC, Berkeley, California. 1969.

This report describes the attempt to model the rational investment behavior of people in the face of floods. The objective was to improve the methods of designing flood control and flood relief systems primarily by contributing a computable model of people's various reactions in terms of economic decisions.

Riparian Ecosystems: A Preliminary Assessment of Their Importance, Status, and Needs. Fish and Wildlife Service, Kearneyville, West Virginia. 1980.

This paper contends that present conservation efforts are inadequate in retaining riparian ecosystems, which have tremendous value in themselves and as a buffer zone.

Survey and Evaluation of Social Science Research on Flood-Damage Abatement. Paulson, Steven K., Lawrence, Wayne E., Virginia Polytechnic Institute. 1979.

The report evaluates available research on the human, social aspects of flood damage abatement. A bibliography of the most relevant materials on the subject matter is examined.

Water and Environmental Quality. Oregon State University, Corvallis. Water Resources Research Institute fall seminar. 1967/68.

Oregon's water resource problems are discussed and general solutions are offered. Topics include floodplain management, pollution, legislation, and forestry.

B6. Land Use and Land Acquisition

Amortization of Nonconforming Uses in Floodplains. Walker, William R. Water Resources Research Center, Virginia Polytechnic Institute, Blacksburg. Journal of the Urban Planning and Development Division, ASCE 96 (1970), pp. 1-16.

> Most courts uphold zoning ordinances with provisions to remove nonconforming uses through amortization. Amortization is the best method in the case of floodplains. Prevalent court theories and commonly cited cases are described.

Floodplain Acquisition: Issues and Options in Strengthening Federal Policy. Kusler, Jon A., Water Resources Council, Washington, DC. 1979.

> The purpose of this report is to explore key issues in floodplain acquisition (including relocation of structures in floodways and coastal high hazard areas) and to suggest options for strengthening the federal role.

Floodplain Management in Project Planning. Haugh, J.S. Soil Conservation Service, Washington, DC. ASCE 79-2580. St. Joseph, Michigan. 1979.

> Any flood control plan must consider future land use. If proper land use can be assured, floods need not be confined to a single channel. Also care must be taken to consider the infrequent, but unusually severe, storm.

Floodplain Management Through Allocation of Land Uses--A Dynamic Programming Model. Hopkins, Lewis D., Brill, E. Downey, Jr., Liebman, Jon C., and Wenzel, Harry G., Jr. Urbana Water Resource Center, University of Illinois--Urbana-Champaign. Office of Water Research and Technology, Washington, DC. 1976.

> Reducing flood damage requires better patterns of land use. A dynamic programming model shows the best combination of land uses, both upstream and downstream.

A Methodology for Planning Land Use and Engineering Alternatives for Floodplain Management. Weisz, R.N. Ann Arbor, Michigan. University Microfilms, 48106 (Order No 74-2013). Ph.D. Dissertation. 1973.

> Methods for analysis and decision making can determine the least expensive method of floodplain management. A computer makes rules for combining various engineering and land-use alternatives.

A Model for Predicting Flood Hazards Due to Specific Land Use Practices. Ross, B., Contractor, D., Li, E., Shanholtz, V., Corr, J., Virginia Polytechnic Institute and State University, Dept. of Civil Engineering, Blacksburg, Virginia. 1976.

This bulletin describes a finite element model for mathematically projecting overland and channel flow over a drainage area under excess rainfall. The procedure used allowed arbitrary land-use changes to be incorporated into the model to observe a particular river's response under flood conditions.

Policy and Program Analysis of an Open Land Approach to Floodplain Management. Royer, Jack P.; Wilkins, Bruce T.; and Allee, David J. Center for Environmental Research, Cornell University, Ithaca, New York. Office of Water Research and Technology, Washington, DC. 1978.

Flood management in the United States tends away from construction and towards land-use planning. New emphasis leads to using floodplains as parks and open space. The Susquehanna River Basin of southern New York State shows relevant land-use patterns, economics, and politics.

State and Local Acquisition of Floodplains and Wetlands. Handbook on the Use of Acquisition in Floodplain Management, U.S. Water Resources Council, Ralph M. Field Associates, Inc. 1981.

This handbook was developed to assist local government officials experienced with floodplain management but not floodplain acquisition.

Valuation and Acquisition of Floodplain Lands for Stream Valley Parks. Floyd, Charles F., Georgia Institute of Technology, Atlanta, Georgia. 1982.

As more and more communities have become aware of the economic and environmental benefits arising from the protection of floodplains, interest has risen in the concept of stream-valley parks. The appraisal and acquisition of floodplain property for parks are discussed.

B7. Engineering, Hydraulic, and Hydrologic Studies and Mapping

Analysis of Uncertainty in Floodplain Mapping. Burgess, S.J., Water Resources Bulletin, Vol. 15, No. 1, pp. 227-243. 1979.

Several elements contribute to uncertainty in locating the floodplain fringes of a mapped floodplain. These criteria are more suitable for use in areas where development is occurring, and should help to establish credibility of the final plan.

Applications of Remote Sensing to Watershed Management. Rango, A., National Technical Information Service, Springfield, Virginia. 1975.

The application of aircraft and satellite remote sensing systems as it relates to watershed management, primarily in the areas of snow mapping, surface-water inventories, flood management, hydrologic land-use monitoring, and watershed modeling is discussed.

Capacity of River Channels with Floodplains. Baryshnikov, N.B., Subbotina, E.S. Hydrotechnical Construction, Vol. 17, No. 6, pp. 302-306. 1983.

Technical paper investigating the interaction of channel and floodplain flows.

Federal Guidelines for Selecting and Accommodating Inflow Design Floods for Dams. Federal Emergency Management Agency, FEMA, Washington, DC. 1984.

The primary purpose of this document is to provide general guidelines on procedures for selecting and accommodating inflow design floods (IDFs) for use by federal agencies in developing agency criteria. It is expected each agency will supplement these general guidelines as necessary to accomplish their specific mission. The Federal Guidelines for Dam Safety outlined the technical activities that agency management needs to undertake to ensure safe design of dams. The Interagency Committee on Dam Safety has established an interagency work group to provide more complete guidelines for selecting and accommodating IDFs to ensure more uniformity in application.

Flood Hazard Identification and Floodplain Management on Alluvial Fans. Hagura, L.M.; Wood, D.E., Water Resources Bulletin, Vol. 16, No. 1, pp. 56-62. 1980.

This paper focuses on a special study procedure that the Federal Insurance Administration (FIA) has developed and requires flood insurance study contractors to use for identifying alluvial fan zones. The true degree of flood hazard that exists on alluvial fans has not been recognized by planners, developers, and local officials.

Floodplain Mapping Using Computer Graphics. GKY and Associates, Inc., Springfield, Virginia. For the Office of Water Research and Technology, Washington, DC. National Technical Information Service PB81-231870. 1981.

A computer program developed by the Corps of Engineers was adapted to provide computer graphics that would help specify flood areas. The study included, among other things, writing user manuals and conducting demonstrations.

Guidelines for Determining Flood Flow Frequency. Bulletin #17B, Hydrology Committee. U.S. Water Resources Council, Washington, DC. 1981.

Recommends a consistent approach to estimating flood-flow frequency. Presents techniques for determining flood-flow frequency.

How to Read Flood Hazard Boundary Maps. HUD-FIA 149(2), Washington, DC. 1976.

How to Read Flood Insurance Rate Maps. HUD-FIA, Washington, DC. 1977.

Hydraulic Resistance of Floodplains. Sokolov, Y.N., Water Resources (English Translation) Vol. 7, No. 6, pp. 563-572. 1980.

Hydraulic resistance determines the characteristics of flow and depends mainly on the standard deviations of averaged elevations in the direction of the flow. Data from aerial photographs, ground topography, and botanical information can be used to establish standards for the roughness of relief and vegetation of a floodplain.

Hydraulics of Main Channel Floodplain Flows. Ric, Charles, E., Oklahoma State University. 1974.

This study tested steady and irregular flow with three surface roughnesses at five different slopes. The major objective was to evaluate, from physical experiments, the effect of floodplain flow on the flow in the main channel.

Hydrologic Extreme Value Model and Risk Analysis Applied to Floodplain Management. Ashkar, F., El-Jabi, N., and Rouselle, J. Ecole Polytechnique, Montreal, Quebec Department of Civil Engineering. In "Proceedings of the Technology Transfer Workshop, Modelling Activities Related to Flood Damage Reduction." Inland Waters Directorate, Ottawa, Ontario, Canada, Technical Workshop Series No. 2, pp. 432-446. 1980.

Development may be regulated, and insurance risks computed, by dividing floodplains into zones. A mathematical model will compute insurance risks based on flood frequency and level.

Modeling for Alternative Criteria for Dual Purpose Detention Basins. Whipple, E. Jr; Clement, W.H.; Faust, S.D. National Technical Information Service, Springfield, Virginia. 1981.

Modeling was conducted of the passage of 2-year, 10-year and 100-year mean frequency floods through detention basins designed in accordance with various design criteria, including those with the single purpose of flood control as well as those with the additional purpose of removing particulate pollution. Other insights are developed as to the effectiveness of various criteria for flood control and for alleviation of channel erosion tendencies.

Monitoring Flood Damage with Satellite Imagery. Benson, L.A., Waltz, F.A., South Dakota State University. 1973.

Analysis of ERTS-1 imagery for land-use patterns permitted an estimate of the crop damage loss for an area inundated by floodwaters from a severe local rainstorm.

NWS Simplified Dam Break-Flood Forecasting Model. Federal Emergency Management Agency, Wetmore, Jonathan N. NOAA-NEWS, Silver Spring, Maryland. 1980.

The Federal Emergency Management Agency (FEMA) is responsible for the coordination of federal efforts to promote dam safety. FEMA has developed the National Dam Safety Program addressing federal and nonfederal programs to protect the public. This report provides a low-cost model to predict areas likely to be flooded by a dam break.

Passage of Floods Over River Floodplains. Gendelman, M.M. Hydrotechnical Construction, Vol 15, No. 11, pp. 692-697. 1981-1982.

Factual information on river runoff shows that methods of hydraulic calculation of the characteristics of floodplain flow are not sufficiently reliable. Physical modeling was examined for studying the passage of floods over the floodplain of a large meandering river.

Pilot Study in Floodplain Management. Mueller, A.C., and Hoffman, J.E. Washington State University, Pullman. In "Hydraulic Engineering and the Environment: Proceedings of the 21st Annual Hydraulic Division Specialty Conference," pp. 113-120. ASCE, New York. 1973.

A scale model of one mile of the river flowing through Pullman, Washington, was built. The model was then used to study the effects of various flow levels, obstructions, and floodplain management efforts, as well as to provide a visual overview of flooding problems.

Plan for Development of Systematic Procedures to Aid Corps Districts in Flood Damage Calculations. LaGarde, Victor E., Army Engineering Waterways Experiment Station, Vicksburg, Mississippi. 1979.

This plan incorporates improvements to existing Corps capabilities for estimating flood damage and uses new techniques for data acquisition and processing, calculations of many types of damage to land, and aggregation of results on single floods, flood zones, and average annual bases.

B8. Design Guides and Handbooks

Design Guidelines for Flood Damage Reduction. Federal Emergency Management Agency (FEMA), Washington, DC. 1981.

The manual focuses on the need for improved building and site design in flood-prone areas--not, however, in isolation from effective floodplain management, which must accompany improved design if flood losses are to be reduced significantly.

Design Manual for Engineering Analysis of Fluvial Systems. Arizona Dept. of Water Resources, Phoenix, Arizona. 1985.

The referenced design manual addresses the dynamics of watershed and channel systems considering hydrologic, hydraulic, geomorphic, erosion and sedimentation aspects. The purpose of the manual is to present techniques and procedures that may be used to make a thorough engineering analysis of major fluvial systems so natural processes associated with such systems can be accounted for in project design.

Elevated Residential Structures. Federal Emergency Management Agency, Washington, DC. 1984.

This manual is for designers, developers, builders, and others who wish to build elevated residential structures in flood-prone areas.

Flood Emergency and Residential Repair Handbook. Anderson, C.M., and Anderson, P.E., FEMA-FIA, Washington, DC. U.S. Government Printing Office. 1979.

Procedures for dealing with flood hazards and damages to homes and their contents are described.

Flood Protection at Bridge Crossings. Simons, D.B., Lewis, G.L., Colorado State University. 1971.

Techniques for designing stable, rock-riprap protection in the vicinity of bridge crossings are presented. Design steps for prototype bridge crossings are enumerated so that the hydraulic engineer may use this report as a design manual.

Flood Protection at Culvert Outlets. Simons, D.B., Stevens, M.A., Watts, F.J., Colorado State University. 1970.

Techniques for designing stable rock-riprap protection at culvert outlets are presented.

Flood Proofing Regulations. Department of the Army, Office of the Chief of Engineers, Washington, DC. 1972.

Introduction to Flood Proofing. Shaeffer, John R., Bauer, William J., Gold, Phillip, Hackett, James, Lewis, Richard, Chicago University Illinois Center for Urban Studies. 1967.

This publication explains techniques for preventing flood damage to the structure and contents of buildings in a flood hazard area. It is intended to acquaint public officials, building owners, and professionals with the essential principles and to outline and illustrate a number of simple but effective measures for reducing flood damage.

Manual for the Construction of Residential Basements in Non-Coastal Flood Environs. Department of Housing and Urban Development, FIA, Washington, DC. 1977.

This manual is intended to meet the safety requirements of the National Flood Insurance Program.

B9. Floodplain Regulations

Developing Dam-Break Flood Zone Ordinance. McMahon, G.F. Journal of the Water Resources Planning and Management Division, Proceedings of the American Society of Civil Engineers, Vol. 107, No. WR2, pp. 461-476. 1981.

This paper describes work by the Georgia Safe Dams Task Force to put into practice guidelines for estimating inundation areas for a number of dams. A proposed model ordinance would solve problems caused by inexperience, non-standardization of methods used to delineate such areas, and conflicts of interest.

A Perspective on Floodplain Regulations for Floodplain Management. Kusler, John A., Department of the Army, Office of the Chief of Engineers, Washington, DC. 1976.

Many of the issues concerning floodplain regulations are addressed.

Regulation of Flood Hazard Areas to Reduce Flood Losses. Vol. 2, Part V-VI. Water Resources Council, Washington, DC. U.S. Government Printing Office. 1973.

State and local governments should regulate land and water areas to reduce flood losses.

Regulation of Flood Hazard Areas to Reduce Flood Losses. Vol. 3. Water Resources Council. Kusler, John A. Washington, DC. 1982.

This volume documents progress and problems with floodplain regulations in the 1970s and suggests strategies for the use of regulations as part of broader floodplain management efforts in the 1980s.

Regulatory Floodway in Floodplain Management: Technical Report. Minnesota Department of Natural Resources, Division of Water, Floodplain Management, St. Paul. 1977.

The "floodway" concept of floodplain management is described.

B10. Structural and Nonstructural Flood Hazard Reduction

Annotations of Selected Literature on Nonstructural Floodplain Management Measures. Owen, H. James. Palo Alto, California. 1977.

A comprehensive literature review concerning nonstructural measures for floodplain management is presented. The economic, social, institutional, and legal consequences of such measures, as opposed to structural ones, are hard to determine. This bibliography, with subject index, will aid in literature searches.

Effect of Transportation Planning on Floodplain Management. Lee, T.M. Wisconsin Department of Natural Resources, Madison. ASCE J Hydraulics Division 98 (1972), pp. 475-488.

Standards are explained and floodplain management programs are developed. Special attention is paid to transportation systems.

Flood Hazard in the United States: A Research Assessment. White, G.F. Institute of Behavioral Science, University of Colorado, Boulder. National Technical Information Service PB-262 023. 1975.

U.S. flood distribution, changes in floodplains, effects on the nation, the effect of natural forces on flood management, and the 1972 flood in Rapid City, South Dakota are discussed. New research could improve the efficiency of flood management.

Flood Hazard Mitigation. Ackermann, C. National Science Foundation, Washington, DC. 1980.

New approaches to nationwide flood problems are needed. Discussion includes the nature, causes, distribution, and trends of floods. Public reaction and flood management are also surveyed.

Flood Hazard Mitigation, Handbook of Common Procedures. Regional Interagency Hazard Mitigation Team. FEMA, Washington, DC. U.S. Government Printing Office. 1981.

Mitigation for reducing flood damage losses is described. Nonstructural measures have an important role alongside structural measures.

Flood Proofing Rural Residences. A Project Agnes Report, Pennsylvania. Black, Richard D. Department of Agricultural Engineering, New York State College of Agriculture and Life Sciences, Ithaca. Economic Development Administration, Office of Technical Assistance, Washington, DC. 1975.

The Economic Development Administration and the U.S. Office of Water Resources Research funded a multidisciplinary study of flood management. Structural problems of flood-proofing houses are discussed.

Formulation of Nonstructural Flood Control Program. James, L., Water Resources Bulletin, Vol. II, No. 4, pp. 688-705. 1976.

This paper describes a method of setting up a community program that considers awareness, economic factors and physical conditions in a specific floodplain.

Guide for Flood and Flash Flood Preparedness Planning. Department of Commerce, Washington, DC. 1970.

Guidelines for Flood Damage Reduction. Army Engineering District, Sacramento, California. 1976.

Local governments manage floodplains separately or in conjunction with management of flood waters. Conventional methods change floodplain landscapes; unconventional ones regulate floodplain development. Many alternatives for both are described.

Guidelines for Reducing Flood Damages. Corps of Engineers, Vicksburg, Mississippi. 1967.

Measures for reducing or preventing flood damages are divided into three groups: control over the river, control over the land, and other measures.

Implementation of Nonstructural Alternatives in Flood Damage Abatement. Proceedings of a conference on informational and research needs. Durham, New Hampshire. 1976.

Land Use Controls in Floodplain Management. Dzurik, Andrew A. Florida State University, Tallahassee. J Environmental Systems 8 (1978 -1979), pp. 253-265.

Since the nineteenth century, floodplain management in the United States has evolved from a local responsibility, focusing on structural flood control, to a complex public responsibility concerned with land-use management.

Land Use Management: An Economic Necessity. James, L. Douglas. University of Kentucky, Lexington. Water Resources Research Center, Virginia Polytechnic Institute, Blacksburg.

Excessive restrictions can hamper economic growth. However, excessive development can lead to severe damage. Flood management, therefore, should emphasize best, rather than least, use. In flood management, landowners' nonstructural methods and communities' structural methods can be made to work together.

Nonstructural Floodplain Management Study: Overview. White, Gilbert, Water Resources Council, Washington, DC. 1979.

This study focuses on impediments to federal sponsorship of nonstructural measures for floodplain management.

Nonstructural Measures in Flood Damage Reduction Activities. Gallorway, Gerald E., Military Academy, West Point, New York. 1980.

This report reviews actions taken by the Depts. of Army, Agriculture and Interior in support of President Carter's emphasis on the use of nonstructural measures and to comment on areas for potential improvement and on impediments to successful operation of nonstructural flood damage reduction program. It also represents the results of a review of federal documents on nonstructural flood damage reduction and selection project report of the agencies.

Nonstructural Methods of Floodplain Management, Identification, Evaluation, and Selection. Fraser, William Eugene. Landscape Architecture Thesis, University of Illinois, Urbana. 1970.

Nonstructural methods of floodplain management are described and evaluated, and a selection process is developed. Nonstructural methods include protection, education, and regulation measures.

Optimal Mix of Adjustments to Floods. Morin, T.L.; Meier, W.L., Jr.; and Nagaraj, K.S. School of Industrial Design, Purdue University, Lafayette, Indiana. National Technical Information Service PB81-240533; Purdue University Water Resources Research Center Technical Report No. 139. 1981.

Dynamic computer programming can help determine the best combination of structural and nonstructural methods for a given flood management task.

Physical and Economic Feasibility of Nonstructural Floodplain Management Measures. 1978. Johnson, William K. Hydrological Engineering Center, Davis, California. U.S. Government Printing Office. 1978.

Eleven common, nonstructural measures for floodplain management are examined. Physical and economic feasibility of the different measures are evaluated, and the advantages of each measure are summarized.

Practices and Problems in Floodplain Management. Tucker, L. Scott. In "Proceedings of the Engineering Foundation Conference on Improved Hydrological Forecasting—Why and How?" pp. 333-341. ASCE, New York. 1980.

Floodplain management practices and problems are discussed, including federal flood insurance, federal commitment and authorization, urbanization, land acquisition, financing, maintenance, and public awareness.

A Regional Planning Approach to the Floodplain Management Problem. Weisz, R.N., and Day, J.C. Department of Agricultural Economics, University of Arizona, Tucson. Annals of Regional Science IX (1975), pp. 80-92.

The Floodplain Management System, a simple, straightforward method for evaluating flood management programs, focuses on the cost efficiency of combined structural and nonstructural programs. The system was tested in Pima County, Arizona.

Reducing Flood Insurance Claims through Flood Warning and Preparedness. Owen, H. James; Wendell, Mitchell; Jorgensen, Jack; Hughes, Mark; Flood Loss Reduction Associates, Palo Alto, California. 1983.

A preliminary evaluation was made of the engineering, legal, economic and institutional aspects of offering a differential in flood insurance rates for communities having flood warning and preparedness programs.

B11. Studies in Other States, Regions, and Countries

Assessment of Upper Mississippi River Floodplain Changes with Sequential Aerial Photography. Olson, K.N. PhD Thesis, University Microfilms International, Ann Arbor, Michigan. 1980.

This study reports the types and extent of natural and man-influenced changes in floodplain features in the Upper Mississippi River Valley from Minneapolis, Minnesota, to Guttenberg, Iowa, over the 35-year period following completion of the 9-foot navigation project in 1938. Comparison of sequential aerial photography was used to determine precisely and accurately the changes that have occurred over time in land and water surface areas and in land use.

Expanded Floodplain Information Study, Willow, Alaska. Army Engineers District, Anchorage, Alaska. 1980.

Hydrologic information and floodplain regulatory policies for the site of Alaska's new capital city were evaluated using a computerized data management and analysis system. Flooding will increase as a result of development, but certain construction measures can reduce its effects.

Floodplain Management Needs Peculiar to Arid Climates. James, L.D., Larson, D.T., Hoggan, D.H., Glover, T.F. Water Resources Bulletin, Vol. 16, No. 6, pp. 1028-1029. 1980.

The national flood control and floodplain management programs designed for humid areas have not been effective in arid climates. The major risks in arid areas are narrow mountain canyons and at the apex of alluvial fans. Generally, mapping shows risks too high in the designated floodplains and too low outside. Although this study is specific to Utah, the general conclusions are applicable to Montana.

Floodplain Management and Implementation Strategies for FPM Programs. Dougal, Merwin D., Rossmiller, Ronald L., and Austin, T. Iowa State Water Resources Research Institute, Ames; Office of Water Research and Technology, Washington, DC; University of Wisconsin, Madison; Water Resources Center, University of Nebraska, Lincoln; Water Resources Research Institute; and Missouri River Basin Water Institute Consortium. 1974.

Representatives to a Midwest workshop identified and discussed research needs in floodplain management. Land use, engineering, economics, and politics were discussed. Procedures and regulations for Iowa and Illinois are included.

Floodplain Management: Iowa's Experience. Papers presented at Conference on Floodplain Management, Iowa State University, Ames. Dougal, M.D. ed. Iowa State University Press, Ames. 1969.

Conference presentations deal with the philosophy and necessity of floodplain management; present and future problems in Iowa; the planning, implementing, and legality of management; and successes in other states.

Floodplain Regulation in Ontario: An Analysis of Existing and Proposed Policy in the Grand and Credit River Watersheds. Gardner, J., and Mitchell, B. Department of Geography, University of Waterloo, Ontario. Journal of Environmental Management 11 (1980), pp. 119-131.

Floodplain management in Ontario since 1940 is reviewed. Changes in the program in 1977 divide floodplains into "floodways" and "flood fringes." Greater development is allowed in flood fringes, jurisdictional problems arise. Another problem is that financial arrangements favor development in flood-prone areas.

Flood-Prone Areas and Land-Use Planning: Selected Examples from the San Francisco Bay Region, California. Waanenen, A.O., Limerinos, and Kockelman, W.J. USGS and HUD Office of Policy Development and Research, Washington, DC. U.S. Government Printing Office. 1977.

Floodplain planning, management, and regulations in the San Francisco Bay region are reviewed.

Improved Floodplain Management Can Be Cost-Effective. Biggs, J.A. American City and County, Vol. 98, No. 4, pp. 43-44. 1983.

Solutions to a severe flood damage problem in New Jersey can be applied elsewhere. Documentation of a 1979 flood became a basis for further studies--photographs with a time log were used for a land survey backed by engineering data. The completed study has served as a basic reference tool for township decisions on road placement, sites for housing and public buildings, and as evidence in court proceedings.

Improving the Effectiveness of Floodplain Management in Western State High-Risk Areas, Alluvial Fans, Mudflows, Mud Floods. Proceedings of a Workshop. Natural Hazards Research and Applications Information Center. 1984.

Forty authorities addressed the issues of the seriousness of alluvial fan, mud flood, and mudflow problems; the adequacy of existing maps, regulations, insurance and other management approaches; and improving management effectiveness in these areas.

Post-Flood Recovery and Hazard Mitigation: Lessons from the Massachusetts Coast. 1978. Platt, R.H., McMullen, G.M. National Technical Information Service, Springfield, Virginia. 1980.

Although its title suggests a regional interest, the "lessons learned" are valuable for any area where high risk is associated with high property values. If homes sustain damage below 50% of their pre-storm fair market value, such structures can be rebuilt in floodplains, perpetuating disaster potential.

Shore and Floodplain Management Strategies in British Columbia and Washington State: An International Comparison. Barker, M.L.; Morgan, W.B. Canadian Water Resources Journal, Vol. 6, No. 1, pp. 3-24. 1981.

This report compares the similarities between Washington state's and British Columbia's development of shorelines and floodplains and resulting increase in flood damage. The differences between their management approaches are contrasted.

State Floodplain Management Activities. Johnson, J.G. State Water Resources Board, Salem, Oregon. ASCE J Hydraulics Division 96. 1970.

The Tennessee Valley Authority pioneered comprehensive floodplain management. Activities in ten states exemplify the concept's evolution. They work primarily to identify floodplains and help local agencies to manage them.

Water Resources Development by the U.S. Army Corps of Engineers in Utah: 1975. Corps of Engineers, South Pacific Division, San Francisco, California. 1975.

Report on Corps of Engineers' flood control and management activities in Utah. Authority, water resources development, and investigations also are discussed.

SECTION C

Many problems associated with flooding are caused by upstream development and urbanization, and the resulting increase in runoff. This section contains material on the social, financial, and technical aspects of stormwater management.

C. Stormwater Management and Urban Drainage

Better Ways to Finance Stormwater Management. Poertner, H.G., Civil Engineering, New York, Vol. 51, No. 4, pp. 67-69. 1981.

Annual losses and damages from surface runoff in the United States were estimated at $3 billion in 1978. Financing methods for preventive and corrective programs are discussed.

Economics of Urban Stormwater Management. Maher, M.D., PhD Thesis, Rice University, Houston, Texas. 1980.

Urban flooding and water quality problems are due to both natural phenomena and increases in runoff due to urbanization. Development of upstream land increases the rate and amount of stormwater runoff from these areas. The consequences of increased upstream runoff are borne by downstream residents in the form of increased flooding and water pollution. The concept of watershed-wide stormwater management is presented.

Pilot Planning Study for Area-Wide Storm Drainage Planning. Vols. I and II. Wright-McLaughlin Engineers, Denver, Colorado. 1969.

North Boulder, Colorado, was used for a pilot study of a method for planning regional storm drainages, of financing strategies, of the"Urban Storm Drainage Criteria Manual," and of drainage alternatives. Volume One contains text; Volume Two contains drawings.

Proceedings, Urban Stormwater Management Seminars, Atlanta, Georgia, November 4-6, 1975 and Denver, Colorado, December 2-4, 1975. National Technical Information Service, Springfield, Virginia 22161. 1976.

Papers presented at the Urban Stormwater Management Seminars discussed the urban stormwater problems, solutions, and institutional and legal aspects of urban stormwater management.

Select Topics in Stormwater Management Planning for New Residential Developments. Berwick, R., Shapiro, M., Kuhner, J., Luecke, D., Wineman, J. National Technical Information Service, Springfield, Virginia, 22161. 1980.

Areas of research undertaken in this study included: the evaluation of pollutant accumulation and washoff data; development of production functions for stormwater management measures; formation of single stochastic models for stormwater management; estimation of cost models for control measures, and evaluation of institutional and political problems in implementing non-conventional control measures.

Stormwater Management Model: Transfer of Technology. Torno, H.C.; Water Knowledge Transfer, Vol. 2, Proceedings of the Second International Conference on Transfer of Water Resources Knowledge. 1977.

Since its development in 1970, the U.S. EPA's Stormwater Management Model (SWMM) has become a widely used urban drainage model in the United States and Canada. An effective technology transfer program has been central to its continued popularity with engineers and planners in both the public and private sectors.

Stormwater Management in the United States: A Study of Institutional Problems, Solutions and Impacts. Poertner, H.G., National Technical Information Service, Springfield, Virginia 22161. 1980.

This study is based on interviews made in urban and metropolitan areas to discover successful solutions to institutional problems. The resulting report should be useful to local officials in developing workable programs for managing stormwater.

Streamlined Regulations Could Help Make New Stormwater Management Concepts Part of the Tradition. Water and Pollution Control, Vol. 119, No. 8/9, pp. 22, 23, 37, August/September 1981.

Following Hurricane Hazel an ambitious program of problem identification, analysis, and implementation was begun in the Toronto area. This paper describes its development and application, and some of the legal, procedural, and policy problems to be resolved so that stormwater management can move ahead.

Technology Transfer Program: Urban Stormwater Management Implementation In Iowa. Rossmiller, R.L., National Technical Information Service, Springfield, Virginia. 1983.

Although specific to Iowa, basic precepts of this study can be applied by floodplain managers elsewhere. Its objective is to make stormwater management an integral part of planning in and around urban areas. Model ordinances, funding methods, and facility maintenance are discussed in the resulting design manual. The technical aspects of stormwater management are also presented.

Urban Stormwater Management and Technology: Case Histories. Lynard, W.G., Finnemore, E.J., Loop, J.A., Finn, R.M. National Technical Information Service, Springfield, Virginia 22161. 1980.

This report is the third in a series on urban stormwater and combined sewer overflow management. It presents 12 case histories representing most promising approaches to stormwater control. The case histories evaluate operational facilities or demonstration projects that have significant value. Essential elements cover approach methodology, design considerations, costs, effectiveness, and environmental and socioeconomic impacts.

SECTION D

This section contains studies specific to Montana. The major portion lists floodplain studies, project reports and environmental impact statements by county. Basin studies follow; the last section contains one general study.

The flood insurance studies included in this section are specific to the localities named; these studies identify the existence, location, and severity of flooding problems. They assist local and regional planners in promoting sound land use and floodplain development.

D. Montana Floodplain Studies

D1. Studies by County (including Cities)

Beaverhead County

Flood Insurance Study: Beaverhead County, Montana, Unincorporated Areas. FEMA-FIA. 1981.

Flood Insurance Study: City of Dillon, Beaverhead County, Montana. FEMA-FIA. 1981.

Flood Insurance Study: Town of Lima, Beaverhead County, Montana. FEMA-FIA. 1981.

Floodplain Information, Beaverhead River, Dillon, Montana. Corps of Engineers, Omaha, Nebraska. 1975.

This report describes the flood characteristics of the Beaverhead River from approximately four miles upstream to approximately four miles downstream from Dillon, Montana. Report formed mapping basis for local floodplain management program.

Big Horn County

Flood Insurance Study: Big Horn County, Montana, Unincorporated Areas. FEMA-FIA. 1981.

Flood Insurance Study: Town of Lodge Grass, Big Horn County, Montana. FEMA-FIA. 1981.

Carbon County

Flood Insurance Study: Carbon County, Montana, Unincorporated Areas. FEMA-FIA. 1981

Flood Insurance Study: City of Red Lodge, Carbon County, Montana. FEMA-FIA. 1981

Flood Insurance Study: Town of Fromberg, Carbon County, Montana. FEMA-FIA. 1981.

Flood Insurance Study: Town of Joliet, Carbon County, Montana. FEMA-FIA. 1981.

Cascade County

Detailed Project Report: A Flood Protection Project at Vaughn, Montana (Sun River). Corps of Engineers, Omaha District, Omaha, Nebraska. 1965.

The report commends construction of a local flood protection project (levee) at Vaughn developed within the provisions of Section 205 of the Flood Control Act approved June 30, 1984.

Flood Insurance Study: Cascade County, Montana, Unincorporated Areas. FEMA-FIA. 1979.

Flood Insurance Study: City of Belt, Cascade County, Montana. HUD-FIA. 1979.

Flood Insurance Study: City of Great Falls, Cascade County, Montana. HUD-FIA 1977.

Floodplain Information, Great Falls, Montana. Vol. I. Corps of Engineers, Omaha District, Omaha, Nebraska. 1973.

Volume I describes the flood characteristics of the Sun River starting just north of Horseshoe Lake, west of Great Falls, to the confluence with the Missouri River.

Floodplain Information, Missouri River, Great Falls, Montana. Vol. II. Corps of Engineers, Omaha District, Omaha, Nebraska. 1974.

Volume II describes the flood characteristics for the Missouri River reach extending from 3 1/2 miles upstream from Great Falls to Black Eagle Dam. Report formed mapping basis for local floodplain management program.

Interim Report on Sun River at Great Falls, Montana (with separate appendix). Corps of Engineers, Fort Peck District, Fort Peck, Montana. 1956.

Following the flood of June 1953, locals expressed a keen desire that planning for flood protection for Great Falls be carried forward as rapidly as possible.

Pre-Flood Hazard Mitigation Plans for the City of Great Falls and Cascade County, Montana. Pool, Timothy S. Montana Department of Natural Resources and Conservation, August 1983.

This plan identifies general flood hazards, describes methods of reducing flood damages, and guides further mitigation. Applications for financial assistance to carry out the mitigation recommendations are identified.

Sand Coulee Creek and Upper Tributaries, Flood Hazard Analyses - Cascade County, Montana. Soil Conservation Service, USDA, Bozeman, Montana. 1973.

Requested flood hazard study to help solve local flood problems and to determine the best use of land subject to overflow. Study formed mapping basis for local floodplain management.

Supplemental Environmental Statement, Draft, Sun River Flood Protection Project, Great Falls, Montana. Corps of Engineers, Omaha District, Omaha, Nebraska. 1978.

The levee will provide protection against a 500-year flood event. At present levels it will prevent $1,119,600 in average annual damages.

Custer County

Final Environmental Statement Yellowstone and Tongue Rivers, Miles City, Montana. Local Flood Protection Project. Corps of Engineers, Omaha District, Omaha, Nebraska. 1979.

The proposed project would consist of the construction of a levee for flood protection for Miles City, Montana.

Local Flood Protection Project Yellowstone and Tongue Rivers, Miles City, Montana. Phase I General Design Memorandum No. MY-1, Corps of Engineers, Omaha, Nebraska. 1978.

This study reaffirmed the findings of previous studies that a levee is a feasible alternative for reducing flood damages in Miles City from the Yellowstone and Tongue rivers.

Carbon Hill Watershed, Custer County, Montana (Final Environmental Impact Statement). Soil Conservation Service, Washington, DC. National Technical Information Service EIS-MT-72-4862-F. 1972.

This 287-acre project consists of land treatment measures, four reservoirs, and floodway systems for a 5,950 acre watershed. It will reduce sediment and pollution damage downstream and provide habitat for waterfowl.

Flood Insurance Study: City of Miles City, Custer County, Montana. FEMA-FIA. 1979.

Yellowstone and Tongue Rivers, Miles City, Montana, Draft and Final EIS, Local Flood Protection Project. Corps of Engineers, Omaha, Nebraska. 1978.

Construction of a local flood protection project at Miles City, Montana was first planned in 1949. Due to lack of local interest the project was placed on inactive status. However, interest revived and a restudy was made in 1974. The purpose of this EIS is to review the flood protection plan and restudy and to make a suitable plan.

Yellowstone and Tongue Rivers, Miles City, Montana, Local Flood Protection Project, Summary Report. Corps of Engineers, Omaha, Nebraska. 1978.

The purpose of this study is to review the levee plan as recommended in the project document (1949) and in the Restudy Report (1974). This study will affirm the recommended levee plan or develop a plan that will be more suitable under current conditions.

Dawson County

Flood Insurance Study: City of Glendive, Dawson County, Montana. FEMA-FIA. 1980.

Deer Lodge County

Flood Hazard Analyses, Warm Springs Creek, Anaconda-Deer Lodge County, Montana. Soil Conservation Service, Bozeman, Montana. 1977.

This report describes the flood characteristics of 23.5 miles of Warm Springs Creek from its confluence with the Clark Fork, one mile east of the community of Warm Springs, to the Deerlodge National Forest boundary approximately ten miles west of Anaconda. Report formed basis for local floodplain management program.

Fallon County

Baker Lake Watershed Project, Fallon County, Montana (Final Environmental Impact Statement). Soil Conservation Service, Bozeman, Montana. National Technical Information Service EIS-MT-1327-F. 1973.

A floodwall will protect Baker Lake and the city of Baker, in southeastern Montana, from flood damage. One hundred and eighty-four acres, mostly semiarid rangeland, will be disturbed by the project, which was chosen over many other alternatives.

Flood Hazard Analyses, Sandstone Creek and Tributaries, Baker, Montana. Soil Conservation Service, Bozeman, Montana (expected completion 1986).

This report describes the flood characteristics of the following stream reaches: Sandstone Creek from about three miles east of Baker downstream to a point below the sewage disposal ponds about two miles west of Baker, and three unnamed tributaries of Sandstone Creek in and around Baker. Reports formed mapping basis for local floodplain management program.

Fergus County

Flood Hazard Study, Town of Roy, Fergus County, Montana. Soil Conservation Service, Bozeman, Montana. 1981.

This report describes the flood characteristics of the following three streams. Box Elder Creek, a 2.7 mile reach extending from approximately one-half mile west of Roy to one-half mile east of Roy; unnamed stream, forms the eastern boundary of Roy; unnamed stream, flowing through Roy from west to east. Report formed mapping basis for local floodplain management program.

Flood Insurance Study: Town of Denton, Fergus County, Montana. FEMA-FIA. 1981.

Flood Insurance Study: Town of Moore, Fergus County, Montana. FEMA-FIA. 1981.

Flood Insurance Study: City of Lewistown, Fergus County, Montana. FEMA-FIA. 1981.

Flood Insurance Study: Fergus County, Montana, Unincorporated Areas. FEMA-FIA. 1982.

Flood Insurance Study: Town of Grassrange, Fergus County, Montana. FEMA-FIA. 1981.

Flathead County

Flood Insurance Study: City of Kalispell, Flathead County, Montana. FEMA-FIA. 1980.

Flood Insurance Study: City of Whitefish, Flathead County, Montana. FEMA-FIA. 1979.

Flathead River Flood Control Study, Flathead Lake to Columbia Falls. Alternatives and Their Pros and Cons (Public Brochure). Seattle District, Corps of Engineers, Seattle, Washington. 1973.

This brochure contains a wide range of alternatives available for reducing flood damages along the Flathead River.

Flood Insurance Study: Flathead County, Montana, Unincorporated Areas. FEMA-FIA. 1984.

Environmental Statement -- Flathead Flood Control -- Flathead River Near Kalispell, Montana. Corps of Engineers, Seattle, Washington. 1973.

Construction of a setback levee on the right bank of Flathead River to reduce flood damages near Evergreen and Days Acres.

Floodplain Information, Flathead, Stillwater and Whitefish Rivers, Kalispell-Columbia Falls, Montana. Corps of Engineers, Seattle, Washington. 1969.

This report describes the flood characteristics of the Flathead River from river mile 125.6 near Kalispell to river mile 147.6 upstream of Columbia Falls. It also describes the lower five miles of the Stillwater River and the Whitefish River from the mouth upstream to the county bridge at mile 2.8. Report formed mapping basis for local floodplain management program.

Pre-Flood Hazard Mitigation Plans for the City of Kalispell and Flathead County, Montana. Pool, Timothy S. Montana Department of Natural Resources and Conservation, September 1983.

This plan identifies general flood hazards, describe methods of reducing flood damages, and guides further mitigation. Applications for financial assistance to carry out the mitigation recommendations are listed.

Gallatin County

Pre-Flood Hazard Mitigation Plans for the Town of Three Forks, City of Bozeman, and Gallatin County, Montana. Pool, Timothy S. Montana Department of Natural Resources and Conservation, June 1984.

This plan identifies general flood hazards, describes methods of reducing flood damages, and guides further mitigation. Applications for financial assistance to carry out the mitigation recommendations are given.

Flood Insurance Study: Town of Three Forks, Gallatin County, Montana. FEMA-FIA. 1980.

Flood Insurance Study: Gallatin County, Montana, Unincorporated Areas. FEMA-FIA. 1981.

Flood Insurance Study: City of Bozeman, Gallatin County, Montana. FEMA-FIA. 1981.

Jefferson River at Three Forks, Montana (Final Environmental Impact Statement). Army Engineering District, Omaha, Nebraska. National Technical Information Service PB-208 296-F. 1971.

This 14,700-foot levee, constructed from nearby river alluvium, is intended to protect Three Forks from a 100-year flood. The levee will cover twenty acres of land, temporarily remove wildlife cover, and may provide a collector for pollution.

Special Flood Hazard Information Report, Gallatin River, Gallatin County, Montana. Corps of Engineers, Omaha, Nebraska. 1973.

This report describes the flood characteristics of the Gallatin River from the river mouth to a few miles upstream from Gallatin Gateway, Montana. The study area is 45.2 river miles in length. Report formed mapping basis for local floodplain management program.

East Gallatin River and Upper Tributaries, Flood Hazard Analyses, Gallatin County, Montana. Soil Conservation Service. 1972.

This report describes the flood characteristics of the following stream reaches. The entire East Gallatin River from its mouth to its formation at the confluence of Rocky Creek and Bear Canyon Creek; Bridger Creek from where it empties into the East Gallatin River to approximately 13 miles upstream; Rocky Creek from where it intersects the East Gallatin River to approximately one mile upstream; Bear Canyon Creek from where it joins the East Gallatin River to approximately two miles upstream; Bozeman Creek from where it flows into the East Gallatin River to approximately seven miles upstream. Report formed mapping basis for local floodplain management program.

Golden Valley County

Flood Insurance Study: Town of Lavina, Golden Valley County, Montana. FEMA-FIA. 1981.

Flood Insurance Study: Golden Valley County, Montana, Unincorporated Areas. FEMA-FIA. 1981.

Granite County

Flood Insurance Study: Granite County, Montana, Unincorporated Areas. FEMA-FIA. 1981.

Flood Insurance Study: Town of Drummond, Granite County, Montana. FEMA-FIA. 1981.

Flood Insurance Study: Town of Philipsburg, Granite County, Montana. FEMA-FIA. 1981.

Jefferson County

Floodplain Management Study, Big Pipestone Creek, Jefferson County, Montana. Soil Conservation Service, Bozeman, Montana. 1984.

This report describes the flood characteristics of Big Pipestone Creek. The downstream end of the study reach begins at the confluence with Jefferson Slough, about one mile southeast of Whitehall. The upstream end of the study area is about four miles west of Whitehall at the U.S. Highway 10 crossing. The study reach is 6.5 miles long. Report formed mapping basis for local floodplain management program.

Lewis and Clark County

Flood Insurance Study: City of East Helena, Lewis and Clark County, Montana. FEMA-FIA. 1979.

Flood Insurance Study: City of Helena, Lewis and Clark County, Montana. FEMA-FIA. 1981

Flood Insurance Study: Lewis and Clark County, Montana, Unincorporated Areas. FEMA-FIA. 1985.

Lincoln County

Flood Insurance Study: Lincoln County, Montana, Unincorporated Areas. FEMA-FIA. 1980.

Flood Insurance Study: Town of Troy, Lincoln County, Montana. FEMA-FIA. 1980.

Flood Insurance Study: Town of Eureka, Lincoln County, Montana. FEMA-FIA. 1979.

Flood Insurance Study: City of Libby, Lincoln County, Montana. FEMA-FIA. 1979.

Missoula County

Grove Creek Flood Prevention RC&D Measure Plan. U.S. Department of Agriculture Soil Conservation Service, Bozeman, Montana. 1980.

The primary objective is to alleviate the flooding problem in the lower watershed of Grove Creek.

Floodplain Information Clark Fork River, Missoula, Montana. Corps of Engineers, Seattle, Washington. 1967.

This report was prepared to aid in the solution of local flood problems and in the best utilization of land subject to overflow. Report formed mapping basis for local floodplain management.

Special Flood Hazard Information, Clark Fork River, Vicinity of Missoula to Alberton, Montana. Corps of Engineers, Seattle, Washington. 1973.

This report is intended to assist local residents and public officials in identifying the flood hazard areas so that solutions can be developed to minimize flood damages.

Pre-Flood Hazard Mitigation Plans for the City of Missoula and Missoula County, Montana. Pool, Timothy S. Montana Department of Natural Resources and Conservation, August 1983.

This plan identifies general flood hazards, describes methods of reducing flood damages, and guides further mitigation. Applications for financial assistance to carry out the mitigation recommendations are identified.

Flood Insurance Study: Missoula County, Montana, Unincorporated Areas. FEMA-FIA. 1981.

Flood Insurance Study: City of Missoula, Missoula County, Montana. FEMA-FIA. 1982.

Park County

Floodplain Information Yellowstone River, Livingston, Montana. Corps of Engineers, Omaha District, Omaha, Nebraska. 1974.

This report describes the flood characteristics of the Yellowstone River from about six miles upstream to about six miles downstream from the City of Livingston, Montana. Report formed mapping basis for local floodplain management program.

Powell County

Special Flood Hazard Information Report: Cottonwood Creek, Deer Lodge, Montana. Corps of Engineers. 1972.

Flood Insurance Study: City of Deer Lodge, Powell County, Montana. FEMA-FIA. 1981.

Flood Insurance Study: Powell County, Montana, Unincorporated Areas. FEMA-FIA. 1981.

Ravalli County

Flood Insurance Study: Ravalli County, Montana, Unincorporated Areas. FEMA-FIA. 1982.

Floodplain Mapping and Planning for the 50- and 100-year Interval Flood Zones of the Bitterroot Valley, Montana. Nolan, K. Michael, Montana State University, Bozeman, Montana. 1973.

Although these studies were done in 1973, the resulting flood hazard maps should remain accurate. They are based on river stage monitoring at 15 locations for 14 days during the June snowmelt, and on aerial photographs taken at flood stage before the peak snowmelt.

Sanders County

Special Study, Suggested Hydraulic Floodway, Clark Fork Vicinity of Plains, Sanders County, Montana. Corps of Engineers, Omaha, Nebraska. 1981.

This study will assist state and local governments in identifying flood hazard areas. It provides a basis for planning and regulating land use in the floodplain.

Silver Bow County

Flood Prevention Measures RC&D Measure Plan, Butte-Silver Bow, Montana. Montana College of Mineral Sciences and Technology. 1981.

Investigation of problems with runoff flooding caused by increased construction on the Montana Tech campus.

Flood Insurance Study: Butte-Silver Bow, Montana. FIA. 1979.

Stillwater County

Supplement, Flood Hazard Analyses, Upper Stillwater River and West Fork Stillwater River, Stillwater County, Montana. Soil Conservation Service, Bozeman, Montana. 1980.

This supplement describes the flood characteristics of an additional 4.6 miles of the West Fork of the Stillwater River located about five miles west of Nye. This reach extends upstream from the end of the original study to the Custer National Forest and Stillwater County boundary. Supplement formed mapping basis for local floodplain management program.

Stillwater River and Rosebud Creek Flood Hazard Analyses, Stillwater County, Montana. Soil Conservation Service, Bozeman, Montana. 1974.

This report describes the flood characteristics of the following stream reaches. Stillwater River floodplain between the Yellowstone River and the Johnson Bridge west of Absarokee; Rosebud Creek floodplain between the junction of east and west Rosebud Creeks, and the confluence of Rosebud Creek and the Stillwater River. The report formed mapping basis for local floodplain management program.

Flood Hazard Analyses, Rosebud Creek Tributaries, Stillwater County, Montana. Soil Conservation Service, Bozeman, Montana. 1975.

This report describes flood characteristics of the following stream reaches. Butcher Creek and East Rosebud Creek, from the Smith Bridge to the Carbon County line; West Rosebud Creek, from Smith Bridge to the Custer National Forest boundary; Ingersoll Creek, from its confluence with West Rosebud Creek, to approximately four miles upstream; Fishtail Creek, from its confluence with West Rosebud Creek, to the Custer National Forest boundary; and Fiddler Creek, from its confluence with West Rosebud Creek, to approximately two miles upstream. Report formed mapping basis for local floodplain management program.

Flood Hazard Analyses, Upper Stillwater River and West Fork Stillwater River, Stillwater County, Montana. Soil Conservation Service, Bozeman, Montana. 1979.

This report describes the flood characteristics of approximately 22.5 miles of the upper Stillwater River and approximately 3.2 miles of the West Fork of the Stillwater River. The study area for the Stillwater River mainstem begins approximately two miles northeast of Absarokee and ends at the Custer National Forest boundary approximately three miles southwest of Nye. The West Fork study begins at its confluence with the Stillwater and ends three miles northwest of Nye. Report formed mapping basis for local floodplain management program.

Flood Insurance Study: Stillwater County, Montana, Unincorporated Areas. FEMA-FIA. 1977.

Sweet Grass County

Big Timber-Sweetgrass Creek Flood Restoration Plan, Big Timber, Montana. Gallatin National Forest, Bozeman, Montana.

Flash floods caused excessive streambank and channel damage during the night of August 29, 1971. A plan has been developed to reduce further damage by 1972 peak flow.

Flood Insurance Study: Sweet Grass County, Montana, Unincorporated Areas. FEMA-FIA. 1981.

Teton County

Flood Insurance Study: City of Choteau, Teton County, Montana. FEMA-FIA. 1984.

Flood Insurance Study: Teton County, Montana, Unincorporated Areas. FEMA-FIA. 1983.

Valley County

Floodplain Management Study Milk River and Cherry Creek Near Glasgow, Valley County, Montana. U.S. Department of Agriculture, Soil Conservation Service, Bozeman, Montana. 1984.

This study describes the flood characteristics of the following stream reaches: Milk River, from 4 miles below the Montana Highway 24 bridge upstream about 4.75 miles northwest of Glasgow. Cherry Creek, where it enters the Milk River floodplain just west of Glasgow upstream about 6.5 miles north of Glasgow. The East Fork of Cherry Creek begins at the confluence with Cherry Creek and ends at the Montana Highway 24 crossing. Report formed mapping basis for local floodplain management program.

Wheatland County

Flood Insurance Study: City of Harlowton, Wheatland County, Montana. FEMA-FIA. 1981.

Flood Insurance Study: Wheatland County, Montana, Unincorporated Areas. FEMA-FIA. 1981.

Yellowstone County

Western Unit Flood Protection Project, Billings, Montana (Draft and Final Environmental Impact Statements). Army Engineering District, Omaha, Nebraska. National Technical Information Service PB-204 575D. 1971 and 1972.

The report discusses a diversion project along the western edge of the city of Billings to intercept flood flows from various irrigation and drainage ditches and natural drainage areas, and to conduct these flows around developed areas of Billings. The adverse environmental effects are a loss of agricultural production on 66 acres of irrigated farmland, temporary increase in stream turbidity, dust, and noise associated with project construction.

Flood Hazard Analyses Blue Creek and Duck Creek - Yellowstone County, Montana. Soil Conservation Service, USDA, Bozeman, Montana. 1976.

This flood hazard analysis was requested because Blue and Duck creeks flood periodically and urban development is increasing in these areas. Study formed basis for floodplain management program.

Floodplain Information, Yellowstone River, Vol. I, Billings Metropolitan Region, Montana. Corps of Engineers, Omaha, Nebraska. 1969.

This report describes the flood characteristics of the Yellowstone River in the vicinity of Billings, Montana. The study area extends from approximately seven miles upstream from Billings to approximately seven miles downstream from Billings. Report formed mapping basis for local floodplain management program.

Pre-Flood Hazard Mitigation Plans for the City of Laurel, City of Billings, and Yellowstone County, Montana. Pool, Timothy S. Montana Department of Natural Resources and Conservation, August 1983.

This plan identifies general flood hazards, describes methods of reducing flood damages, and guides further mitigation. Applications for financial assistance to carry out the mitigation recommendations are described.

Floodplain Information, Alkali Creek, Billings Metropolitan Region. Corps of Engineers. 1969.

Floodplain Information Alkali Creek, Volume II, Billings Metropolitan Region, Montana. Corps of Engineers, Omaha District, Omaha, Nebraska. 1969.

This report defines the flood characteristics on Alkali Creek near Billings.

Flood Insurance Study: City of Billings, Yellowstone County, Montana. FEMA-FIA. 1981.

Flood Insurance Study: Yellowstone County, Montana, Unincorporated Areas. FEMA-FIA. 1981.

Flood Insurance Study: City of Laurel, Yellowstone County, Montana. FEMA-FIA. 1981.

D2. Studies by Drainage Basin or Geographic Areas

Annual Peak Discharges from Small Drainage Areas in Montana through September 1977. Omang, R.J., and Hall, J.A. Water Resources Division, USGS, Helena, Montana. 1978.

The changing magnitude and frequency of floods in small Montana drainages from 1955 to 1977 are described.

Final Report Missouri River Floodplain Study. Missouri Basin States Association. 1983.

This report is the last of several floodplain studies funded largely by federal agencies for the Missouri River floodplain below the main stem dams.

Floods of June 1964 in Northwestern Montana: Geological Survey Water-Supply Paper 1840-B. Boner, F.C., and Stermitz, Frank. USGS, Washington, DC. U.S. Government Printing Office. 1967.

Hydrologic data for detailed planning of flood management efforts, especially in northwestern Montana, are presented.

Report on 1952 Spring Milk River Flood, Upper Missouri District Missouri River Basin Milk River Division Montana. U.S. Department of the Interior, Bureau of Reclamation, Region 6, Great Falls, Montana. 1952.

This report collected useful data for hydrologists and meteorologists who may need to make further studies pertaining to floods of the type that occurred in the Milk River Basin during 1952.

Report on Floods in the Fort Peck District. Corps of Engineers, Fort Peck, Montana. 1953.

Data on floods in the Fort Peck District during 1952 were obtained principally by field reconnaissance and flood damage surveys.

Review Report on Flood Control and Allied Purposes for the Marias River Basin, Montana: Appendix 1, Flood History. Corps of Engineers, Omaha District, Omaha, Nebraska. 1967.

A description of the past floods in the Marias River Basin to aid in the detailed delineation of the magnitude, extent, and location of the basin's flood problem.

Stillwater River and Rosebud Creek Flood Hazard Analyses, Stillwater County, Montana. Soil Conservation Service, Bozeman, Montana. 1974.

Sixteen aerial photomaps and other data describe flood areas, surface water, and soils.

Tongue River Basin Probable Maximum Flood. Montana Department of Natural Resources and Conservation, Harza Engineering Company. 1983.

Tongue River Reservoir is a major irrigation storage reservoir. Harza conducted the study to obtain design information for the reconstruction of the spillway.

Water Resources and Hazard Planning Report for the Clark Fork River Valley Above Missoula. Wheeler, Robert J., University of Montana, Missoula, Montana. 1974.

Purpose of the study was the economical production of accurate flood hazard maps, using aerial photos, limited stream channels, and ground surveys.

Yellowstone River Basin and Adjacent Coal Areas, Montana, Wyoming, and North Dakota, Flood Control and Streambank Erosion Control Along Main Stem Reaches. Corps of Engineers, Omaha, Nebraska. 1977.

This report presents potential projects to reduce damages from flooding and streambank erosion.

Yellowstone River Basin and Adjacent Coal Areas, Montana, Wyoming, and North Dakota, Flood Control and Streambank Erosion Needs, Drainage Areas Less Than 400 Square Miles. Soil Conservation Service, Casper, Wyoming. 1976.

Flood damages are estimated using the seven planning areas outlined in the Yellowstone River Basin and Adjacent Coal Area plan of study. Streambank erosion damages are presented by state for each of the tributary areas as shown in the National Streambank Erosion Assessment published in May 1969.

D3. General

Revised Techniques for Estimating Magnitude and Frequency of Floods in Montana. U.S. Geological Survey, Helena, Montana. 1981.

Methods for estimating the flood magnitudes for ungaged sites in Montana have been updated. Information concerning the eight regions of Montana is improved, reducing the standard errors.

SECTION E

Additional materials available from several different sources are listed in this section.

E. Other Resources -- Film, Tapes, Slide Shows, and Bibliographies

Annotations of Selected Literature on Nonstructural Floodplain Management Measures. HEC, Corps of Engineers, Davis, California. March 1977.

Flood Control: A Bibliography with Abstracts. Lehmann, Edward, J., National Technical Information Service, Springfield, Virginia. 1974.

The bibliography contains 191 selected abstracts of research reports involving floods as related to control, forecasting, warning systems, urban planning, prevention, land-use zoning, urbanization, and floodplain management retrieved using the NTIS on-line search system -- NTISearch.

Flood Damage Prevention: An Indexed Bibliography. Water Resources Research Center, University of Tennessee, Knoxville. 1976.

Bibliography emphasizes flood insurance, flood proofing, and nonstructural methods for reducing flood damage. A few selections concern structural flood control.

Floodplain Information Survey. Floodplain Information Repository, Urbana, Illinois.

Local Assistance Series: 1A - Floodplain Publications. Army Engineering District, Chicago, Illinois. Illinois Department of Transportation, Chicago. 1980.

Abstracts describe publications concerning floodplain management.

Natural Disaster Recovery and Mitigation Resource Referral Service. The Resource Referral Service, The Academy for Contemporary Problems, Washington, DC.

North Dakota Floodplain Management: Bibliography. Fahy, Vernon. North Dakota State Water Commission, Bismarck. 1981.

Bibliography lists available information on flooding and flood management. Eight subject headings are used.

Available from FEMA, Building 710, Denver Federal Center, Lakewood, Colorado 80225.

Film: "It Didn't Have to Happen," 15 minutes

Available from Reference Librarian, Montana State Library, 1515 E. Sixth Ave., Helena, MT 59620, 444-3004.

Slide Shows: "Early Flood Warning"
"Channel Straightening . . . A Potential Problem"

The programs were produced by the Federal Emergency Management Agency/U.S. Geological Survey and are available at no charge.